



Original article

Impact of a Mobile E-Health Intervention on Binge Drinking in Young People: The Digital–Alcohol Risk Alertness Notifying Network for Adolescents and Young Adults Project



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A B S T R A C T

Purpose: Binge drinking (BD) is common among young people. E-Health apps are attractive to them and may be useful for enhancing awareness. We aimed to investigate the impact of a publicly available evidence-based e-Health app (Digital–Alcohol Risk Alertness Notifying Network for Adolescents and Young Adults [D-ARIANNA]), estimating current risk of BD by questions, matching identified risk factors, and providing in percent an overall risk score, accompanied by appropriate images showing mostly contributing factors in summary graphics.

Methods: A natural, quasi-experimental, pre-/post-test study was conducted. Subjects were recruited in pubs, clubs, discos, or live music events. They were requested to self-administer D-ARIANNA and were re-evaluated after two further weeks.

Results: Young (18–24 years) people (N = 590) reported reduced BD at follow-up (18% vs. 37% at baseline). To exclude systematic errors involving those lost at follow-up (14%), the diminution in BD was confirmed in an appropriate generalized estimating equation model with unweighted data on a last observation carried forward basis.

Conclusions: Our study provides evidence of population-level benefit at 2 weeks, attained with D-ARIANNA. This can be disseminated easily and economically among young people. However, additional components, including regular feedback and repeated administration by gamification, may be required to make this app suitable for longer term impact.

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IMPLICATIONS AND CONTRIBUTION

Binge drinking (BD) is common among young people, and e-Health tools can be useful for reducing BD. This study tested impact of the e-Health app D-ARIANNA. After D-ARIANNA self-administration, young people reported a reduction in BD (37% vs. 18%). This approach can be disseminated easily and economically among young people.

Conflicts of Interest: The authors have no conflicts of interest or financial disclosures to report.

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Binge drinking (BD) is defined as four or more drinks for women and five or more drinks for men on a single occasion [1]. Although the use of the term may not be entirely appropriate, as compared for example with the term heavy episodic drinking, it is clearly recognizable not only to researchers in the field but also to the general public and young people in particular [2]. It is a significant public health concern in youth, with current rates of up to 27% both in the United States and Europe [3,4]. Young

adults who engage in BD are more likely to report other health risks such as riding with drink drivers, smoking cigarettes, being a victim of violence, attempting suicide, or using illicit drugs [5]. Young people's knowledge and perception of BD risks is often limited [6], with impaired decision-making playing a major role [7] in actions leading to immediate rewards, poor anticipation of the negative consequences, and learning from previous mistakes [8], probably ignoring or considering consequences not relevant to themselves [9].

E-Health applications may encourage behavioral changes related to public health priorities, with >90% of individuals worldwide [10] using mobile phones, including people with substance use disorders [11]. E-Health technology for substance use disorders enables interventions at a population level in a variety of formats and interventions [12]. They have been used across various substances, for a range of populations and settings [13]. The advantages of e-Health for people with addiction problems include accessibility and availability, enhanced patient–clinician communication, the provision of information in an engaging manner, the individualization of the intervention, a greater sense of privacy, and reduced stigmatization or embarrassment about drug use [14]. In particular, e-Health tools have shown encouraging results in identifying BD, reducing alcohol use, and improving continuity of care among young people [15,16]. Given that the beneficial effects of standard preventive drug and alcohol interventions for young adults are modest [17], e-Health tools might obviate some of the difficulties in implementing preventive strategies by taking advantage of young people's propensity to use electronic devices and their expertise with them (e.g., smartphones).

The present study aimed to evaluate the short-term impact, in terms of relapse in BD, of a recently developed evidence-based e-Health app (Digital–Alcohol Risk Alertness Notifying Network for Adolescents and young adults [D-ARIANNA]) that incorporates a risk estimation model for BD in young people [18].

Methods

We used a natural experimental approach, that is, providing an intervention and using the variation in exposure generated to analyze its impact [19]. This is appropriate for evaluating population-level interventions, with repeated measures before and after the intervention [20].

Settings and procedures

Recruitment took place outdoors in urban locations of Greater Milan, a region of about 3.3 million of inhabitants. We chose areas with a high density of pubs, clubs, discos, or live music events. Because the consequences of occasional BD are likely to be significantly different from those associated with more persistent bingeing, a single verbally asked screening question was used to identify a clinically severe population, comprising those with a history of bingeing on alcohol at least once in the past 6 months [21]. Young people (1) aged between 18 and 24 years and (2) owning a smartphone running on Apple iOS or Android (version 4.0 or later) operating systems were consecutively recruited at pubs, clubs, discos, and music events. People reporting current and previous treatments for alcohol use disorders, those with a current psychiatric condition, and those with vision problems were considered ineligible because of risk of treatment and other biases [22]. Participants received an

information sheet and provided signed written informed consent. To facilitate sampling and to minimize embarrassment, the recruitment was conducted by young people similar to the target population, that is, students aged between 18 and 24 years, selected from different schools of Milano Bicocca University. These 12 facilitators received 10-hour training on data collection procedures, including eligibility criteria, and were provided with a clear and unequivocal definition of BD. After a colloquial introduction, facilitators provided standard definitions of both drinks, although with plain language and examples, and BD, explicitly using this term. As a result the question “Did you binge drink in the past two weeks?” implied a closed-ended (yes/no) response. The facilitators provided information on the research project, obtained consent, and introduced and assisted with the e-Health app, helping participants to download it into their smartphones, checking that participants self-administered the e-Health app at least once. As an incentive, people who agreed to participate in the study received a t-shirt with the project logo. To follow-up short-term outcome, facilitators arranged to phone all participants after 14 days, to establish whether they had engaged in BD in the intervening period. Those who answered the call received €10.00 mobile phone top-up as an additional incentive. The facilitators repeated at follow-up the same exact wording, implying a closed-ended response, that was used at baseline. Follow-up occurred 14 days after baseline, regardless of when the app was further used to secure that the period of postintervention assessment was clearly after intervention. Unfortunately, for privacy reasons, we were not able to assess how many times and when the app was further used.

Design

Because of the chosen setting [20], we consequently opted for a natural, quasi-experimental, pre–post test design without a control group [23]. The study was approved by the Ethics Committee of University of Milano Bicocca (The D-ARIANNA study, approval: 0009873/13).

Sample size

For our power calculation, we used information from the Italian Institute of Statistics databases, assuming that in relevant age range, the proportion of subjects who had recently binge on alcohol was 15% [24]. Given a 5% level of significance, 90% power, and attrition of 20%, 589 participants would be needed to detect a 5% difference in BD prevalence rates at follow-up.

The e-health app (D-ARIANNA)

D-ARIANNA provides an evidence-based current risk estimate for BD in young people [18]. First, we designed a questionnaire, to be included in the e-Health app, investigating identified risk/protective factors. We took into account order and wording of the closed questions, to develop suitable response codes. We built short queries, banning negatives, based on phrases that young people can understand, avoiding formal lexicon and placing first simple and basic questions. For questions on impulsivity, we used the Substance Use Risk Profile Scale. Users' answers about risk and protective factors populate an algorithm and based on the coefficients of a relevant estimation model, the e-Health app identifies low- (0%–43%), moderate- (43.1%–82%), and high-risk levels (82.1%–100%) for the single subject, with user-friendly

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